Appendix B

Technical Specifications for Waste Area Group 5, Remedial Design/Remedial Action, Operable Unit 5-12, Phase 1 Sites

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A-E CONSTRUCTION SPECIFICATION

Project File No. 020911

WASTE AREA GROUP 5 REMEDIAL DESIGN/REMEDIAL ACTION-PHASE 1

APPROVED FOR CONTRUCTION

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Idaho National Engineering & Environmental Laboratory
BECHTEL BWXT IDAHO, LLC

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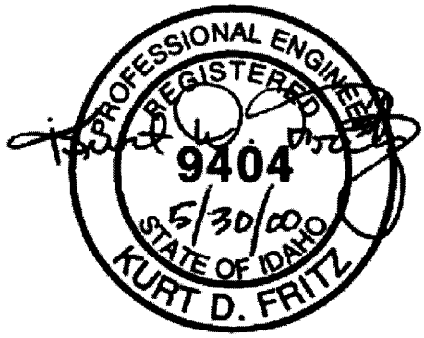
The following Sections of this Specification were prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Civil Engineering.



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SECTION 01005--SUMMARY OF WORK

PART 1--GENERAL

SUMMARY:

Field Operations shall furnish labor, material, equipment, and supplies and perform work and operations necessary to complete the OU 5-12 remedial action in accordance with the Power Burst Facility and Auxiliary Reactor Area Work Plan, engineering drawings, and these specifications.

Section Includes: Work includes, but is not limited to:

Sites	Selected Remedy
ARA-02 Sanitary Waste System	Removal, ex situ thermal treatment, and disposal
ARA-16 Radionuclide Tank (Two Options)	Option 1-Removal of the ARA-16 Radionuclide Tank and contents intact. Removal of sectioned associated piping. Ship for off-site ex situ thermal treatment and disposal (EDF-1406). Excavation of the concrete vault and disposal at an approved facility. Option 2-Removal of the ARA-16 Radionuclide Tank contents for shipment to an off-Site facility for thermal treatment and disposal (EDF-1405). Decontamination and excavation of the tank and associated piping (EDF-1407) and disposal at the RWMC. Excavation of the concrete vault and disposal at an approved facility.
ARA-07 Seepage Pit to East	Removal and disposal of wooden cover and above-ground blocks at an approved on-site facility. Removal and recycling of chain-link fencing. Backfill pit with earthen materials.
ARA-08 Seepage Pit to West	Removal and disposal of concrete slabs at an approved on-site facility. Backfill pit with earthen materials.
ARA-13 Sanitary Sewer Leach Field and Septic Tank	Sampling of manhole, tank and distribution box contents. Based on sampling results: -Removal and disposal of manhole, septic tank, distribution box, and contents for disposal at an approved facility.

	or -Abandon in-place with earthen backfill. Workplan drawings show removal of components.
ARA-21 Test Area IV Septic Tank and Leach Pit No. 2	Sampling of tank and chlorine contact tank contents. Based on sampling results: -Removal and disposal of tank, chlorine contact tank, and contents to an approved facility. Backfill pit with earthen materials. or -Abandon tanks and seepage pit in-place with earthen backfill. Workplan drawings show removal of tank and chlorination contact tank and abandonment in-place of seepage pit.
ARA-25 Soils Beneath the ARA-626 Hot Cells	Removal and disposal of roof structure at an approved on-site facility. Removal and disposal of concrete and soils at an approved on-site facility.

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein.

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910 OSHA General Industry Safety Standards
29 CFR 1926 OSHA Construction Industry Safety Standards

BECHTEL BBWI, LLC

Health and Safety Plan (HASP) for the Remedial Action of Waste Area Group 5, Operable Unit 5-12

Unless otherwise specified, references in these specifications or on the drawings to other specifications, codes, standards or manuals which are part of these specifications, but not included herein, shall be the latest edition, including any amendments and revisions, in effect as of the date of this Specification.

QUALITY ASSURANCE:

Quality Assurance Program requirements exist to assure that work performed is in conformance with the requirements established by the drawings and this specification. QA Program criteria applicable to this scope of work is addressed in these specifications.

SAFETY, HEALTH AND ENVIRONMENT:

In general work shall comply with the applicable sections of 29 CFR 1910, 29 CFR 1926, and the Health and Safety Plan (HASP) for the Remedial Action of Waste Area Group 5, Operable Unit 5-12.

DELIVERY STORAGE AND HANDLING

All materials normally packaged shall be delivered to the site in the original, unopened packages with labels intact. Upon arrival, Field Operations shall inspect the materials or equipment for damage.

Materials and equipment shall be stored and handled in accordance with the manufacturer's instructions.

PART 2--PRODUCTS

MATERIALS:

New Materials and Equipment: Materials and equipment received in a damaged condition shall be repaired or replaced as directed by the Field Team Lead.

Hazardous Chemicals and Substances: Field Operations shall comply with applicable requirements of 29 CFR 1926.59, Hazard Communication Standard.

PART 3--DECONTAMINATION AND DISMANTLEMENT

General: Materials and equipment shall be decontaminated or dismantled only by qualified personnel who are regularly engaged in the trades required to complete the work.

Coordination of Work: Where utilities to be removed are shown on the drawings, but are not located precisely by dimensions, Field Operations shall be responsible for proper location and clearances and for correcting discrepancies and interferences in the work which are a result of their operations. Work done by one trade that must be integrated with work of other trades shall be laid out with due regard to the work done, or to be done, by other trades; particularly if the work done by one trade depends upon proper completion of work done by other trades.

Workmanship: Work shall be done in a skillful and workmanlike manner.

END OF SECTION 01005

SECTION 02010--SUBSURFACE INVESTIGATION

PART 1--GENERAL

SUMMARY:

Field Operations shall furnish all labor, materials, and equipment to perform the subsurface investigations specified herein and on the drawings.

Section Includes: Work includes, but is not limited to:

Identifying the location of buried pipelines.

PROJECT/SITE CONDITIONS:

Site Information: The existing soils at all sites are composed mainly of Type C Soils as identified in CFR 1226 Subpart P, Soil Classification. The depth from the surface to bedrock (basalt rock) contact is generally from 3 to 10 ft.

PART 2--PRODUCTS

MATERIALS AND EQUIPMENT:

Equipment: Field Operations shall be allowed to select the equipment used to locate buried pipelines. Suggested methods and equipment include:

- The collection of magnetic field measurements using fluxgate gradiometers to detect buried ferrous objects.
- The use of time domain electromagnetic induction to generate an electromagnetic pulse which induces eddy current in a range of metallic objects.
- The use of electromagnetic induction that exploits the relationship between electric fields, magnetic fields, and electrical current to detect changes in subsurface conductivity.

All equipment shall be hand operated and in good repair. Operation of equipment shall be designed such as to be non-intrusive.

PART 3--EXECUTION

MAPPING:

Selected equipment shall be used to produce maps as necessary to locate buried pipelines where exact placement is unknown. The equipment operator shall refer to the attached specification drawings to determine the nature and possible extent of target pipelines prior to operation.

FIELD QUALITY CONTROL:

Surveillance will be performed by the Field Team Lead to verify compliance of the work to the drawings and specifications.

END OF SECTION 02010

SECTION 02050--DEMOLITION

PART 1--GENERAL

SUMMARY:

Section Includes: Work includes, but is not limited to:

Demolition and removal of identified items and materials

Salvage of identified items and materials

General Requirements: Waste generated during demolition shall be removed daily, unless otherwise directed, to avoid accumulation at the demolition site. Waste that cannot be removed daily shall be stored in areas specified by the Field Team Lead. In the interest of conservation, salvage shall be pursued to the maximum extent possible; salvaged items and materials shall be collected and stored as specified by the Field Team Lead.

JOB CONDITIONS:

Condition of Structures or Facilities: Actual conditions may vary slightly due to operations which may occur prior to start of demolition work. Current conditions of work areas are described in the Waste Area Group 5, RD/RA Workplan-Phase 1 and illustrated on the drawings.

Protection of Personnel: During the demolition work, Field Operations shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site. No area, section, or component of structural elements will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area. Ensure safe passage of persons in the vicinity of the demolition area.

Structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, may be allowed to remain standing without additional bracing, shoring, or lateral support until demolished. Field Operations shall ensure that no elements determined to be unstable are left unsupported and shall be responsible for placing and securing bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, or demolition work.

Protection of Existing Property: Before beginning any demolition work, Field Operations shall survey the site and examine the drawings and specifications to determine the extent of the work. Field Operations shall take necessary precautions to avoid damage to existing

items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Field Team Lead. Field Operations shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required.

Protection From the Weather: The interior of tanks, pits, and pipelines shall be protected from surface water infiltration due to adverse weather at all times.

Environmental Protection: The work shall comply with the requirements the Waste Area Group 5, RD/RA Workplan-Phase 1. Use suitable methods to limit dust, spread of contamination, or spread of hazardous materials beyond the work area.

Dust Control: The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Suppression measures may include water sprays, use of tarps, keeping vehicle speeds to a minimum, and work controls during periods of high wind. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

Burning: The use of burning at the project site for the disposal of refuse and debris will not be permitted.

Use of Explosives: Use of explosives will not be permitted.

PART 2--PRODUCTS

MATERIALS:

Disposition of Removed Equipment and Materials: The Government will retain title to all equipment and materials removed from the work. Items which are to be reused shall be removed and stored as indicated below. Materials designated as salvage shall be collected and stored as specified by the Field Team Lead.

Reusable Equipment and Materials: Certain items of existing equipment and materials as noted on the drawings shall be removed and stored in such place and manner so that they will not be damaged.

PART 3--EXECUTION

GENERAL:

All demolition and repair work shall be done in a neat and orderly manner without any damage to existing facilities not designated for demolition.

EXISTING STRUCTURES:

General: Existing structures to be removed shall be as indicated on the drawings.

Concrete Floor and Wall Removal: All concrete shall be removed as indicated on the drawings by cutting or breaking in a method approved by the Field Team Lead. All cracked and/or broken concrete shall be removed.

Miscellaneous: All areas disturbed or demolished shall be repaired to match existing adjacent areas.

UTILITIES:

Disconnection of active utility services, with related meters and equipment, shall not be a part of this specification. Existing abandoned utilities (pipelines) shall be removed as indicated. When utility lines are encountered that are not indicated on the drawings, the Field Team Lead shall be notified prior to further work in that area.

FILLING:

Holes, open trenches, open pits and other hazardous openings shall be filled with clean backfill material, see Section 02200 - Earthwork.

FIELD QUALITY CONTROL:

Surveillance will be performed by the Field Team Lead to verify compliance of the work to the drawings and specifications.

END OF SECTION 02050

SECTION 02200--EARTHWORK

PART 1--GENERAL

SUMMARY:

Section Includes: Work includes, but is not limited to:

Clearing and grubbing as required.

Excavating all materials encountered, of every description, for completion of the project as shown on the drawings and as specified herein.

Backfilling of all excavations as specified herein.

Backfilling components to be abandoned in-place.

Compacting all backfill as specified herein.

Finish grading and grading for surface drainage or revegetation.

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein.

CODE OF FEDERAL REGULATIONS

29 CFR 1926 OSHA General Industry Safety Standards, Subpart P

BECHTEL BBWI, LLC

Health and Safety Plan (HASP) for the Remedial Action of Waste Area Group 5, Operable Unit 5-12

PART 2--PRODUCTS

MATERIALS:

Satisfactory Soil Materials: Satisfactory soil materials are defined as those complying with AASHTO M145, soil classification Groups A-1, A-2-4, A-2-5, and A-3.

Unsatisfactory Soil Materials: Unsatisfactory soil materials are those defined in AASHTO M145 soil classification Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7; also peat and other highly organic soils.

Backfill and Fill Material: "Satisfactory" soil materials free of clay, rock, gravel larger than 3 in. in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter. Select pit run gravel is available at the Borax, T12 (SW of RWMC), CFA, or TRA gravel pits. Upon completion of operations involving fill material removal, Field Operations shall grade, reshape and cover the disturbed areas with 6" of topsoil. Sloped surfaces shall meet the requirements of OSHA 29 CFR 1926.

Backfill for Tank and Pit Abandonment: Earthen materials used to abandon tanks and pits in-place shall be loosely placed, dry, granular Type C soils as per 29 CFR 1926 Subpart P-Soil Classification.

PART 3--EXECUTION

EXCAVATION:

Clearing and Grubbing: All areas occupied by the ARA-16 tank, ARA-16 pipes, ARA-02 pipes, ARA-02 septic tanks, and ARA-02 seepage pit plus 10 ft outside these areas and 1 ft outside pipe trench excavations, shall be stripped and cleared of all brush, weeds, rubbish and organic matter. All vegetable matter, roots, brush and debris encountered during the stripping operations shall be removed from the cleared areas to a depth of at least 6-in. below the subsurface. Resulting depressions shall be completely backfilled and compacted in accordance with the applicable part of these specifications except in those cleared areas where further excavation is required. Stripped material shall be stockpiled or disposed of as specified hereinafter.

Earth Excavation: Earth excavation includes removal and disposal of pavements and other obstructions visible on the ground surface, underground structures and utilities indicated to be demolished and removed, soil material of any classification, and other materials encountered that are not classified as rock excavation.

Rock Excavation: Rock excavation is not required.

Trenches: Trenches shall be of sufficient width to provide adequate room for workmen to perform any necessary service and to permit proper compaction of the backfill.

Stockpiling and Disposal: Excavated material that is suitable and required for backfilling, grading or topsoil, shall be piled in an orderly manner a sufficient distance from the edge of the excavation, but in no case closer than 2 ft, and so located that it will not interfere with normal vehicular or pedestrian traffic. Excavated materials to be used for backfill shall be kept free from vegetation and other objectionable materials. Topsoil to be used for finish

grading shall be kept free from subsoil, vegetation and other objectionable materials and stones larger than 1-in. Contaminated excavated materials shall be disposed of properly.

Separate stockpiles will be created for each type of suspected contamination encountered in an Area of Contamination (AOC). When contamination is found in an overlapping AOC, soil will be placed in the stockpile from the higher contaminated AOC. Final determination of the AOC boundaries and contamination type will be made in the field where possible. At no time will soil be added to a stockpile until it is determined to be from the same AOC and contains the same type of contamination. The five probable stockpiles are described as follows:

ARA-16 Contaminated Soil: This soil would include all soil taken from under the ARA-16 pipes and tank that is determined or reasonably expected to be contaminated with ARA-16 waste.

ARA-02 Contaminated Soil: This soil would include all soil taken from under the ARA-02 pipes, 3 septic tanks and the seepage pit that is determined or reasonably expected to be contaminated with ARA-02 waste.

ARA-23 Contaminated Soil: This soil may include the top 6 inches of soil outside the ARA I facility fenceline. Inside the ARA I fenceline, all soil taken from the ground surface to the top of the pipes or tank may be ARA-23 contaminated soil.

ARA-25 Contaminated Soil: This soil includes all soil inside the hot cell footprint from building 626. This soil should be moved aside to remove the pipe, but left inside the hot cell footprint.

Clean Fill: Any soil determined to be below remediation goals by a Rad Con Tech and an Industrial Hygienist or Safety Engineer, may be stockpiled and used as back fill material.

Shoring and Bracing: The sides of all excavations shall be sloped or securely shored and braced in accordance with OSHA 29 CFR 1926, Subpart P. Excavations shall be inspected by a competent person in accordance with 29 CFR 1926, Subpart P.

Control of Water: All excavations shall be kept free of standing water. Field Operations shall furnish, install and operate the equipment required to keep excavations free from water at all times. Surface water shall be diverted to the periphery of all construction areas by constructing temporary ditches, berms or other appropriate means of control.

BACKFILL OR FILL:

General: The excavations shall be cleared of all trash and debris prior to backfilling or filling. All backfill or fill material shall be free from trash, organic matter and frozen

particles. Backfilling or filling shall be done only when approved by the Field Team Lead. In excavations that are shored, shoring and formwork shall be removed or raised as backfill or fill is placed.

Placement: Concentrated dumping of backfill or fill material into excavations will not be permitted except for tanks, distribution boxes, manholes and covered seepage pits that are determined to be abandoned in-place. No water shall be used for placing, settling or compacting backfill or fill except to obtain optimum moisture content. All material must be placed in uniform layers and brought up simultaneously. Uniform layers shall not exceed 12-in. loose measurement for trenches and open excavations and 18-in. for open-topped seepage pits (ARA-07 and ARA-08) determined to be abandoned in-place.

Compaction: All open excavations and trenches shall be backfilled and compacted using 3 to 4 passes by mechanical devices such as rollers, vibratory compactors, or mechanical tampers. Each 12", maximum, loose measurement lift shall be compacted before the next lift is placed thereon. Compacted backfill or fill density and moisture content may be measured by the Field Team Lead at any location and depth. Sections of backfill or fill failing to meet the minimum compaction requirements shall be corrected prior to placement of subsequent lifts. No compaction is necessary for backfilling in-place tanks and seepage pits.

Compact all open-topped seepage pits (ARA-07 and ARA-08) backfill and fill material to at least 85% of maximum density at optimum moisture content as determined by AASHTO T99. Each 18-in, maximum, loose measurement lift shall be compacted before the next list is placed thereon. No compaction is necessary for backfilling in-place tanks, distribution boxes, manholes, and covered seepage pits. These structures shall have the existing lids or covers replaced upon the completion of backfilling.

FIELD QUALITY CONTROL:

Surveillance will be performed by the Field Team Leads to verify compliance of the work to the drawings and specifications.

END OF SECTION 02200

SECTION 02486--REVEGETATION

PART 1--GENERAL

SUMMARY:

This work shall consist of seed bed preparation, sowing of grasses, and application of fertilizer.

Section Includes: Work includes, but is not limited to:

Prepare seed bed, furnish and sow seed, and furnish and apply fertilizer.

Related Work: Section 02200 - Earthwork

REFERENCES:

None.

PART 2--PRODUCTS

Field Operations shall furnish the materials and equipment necessary to revegetate disturbed sites.

MATERIALS:

Grass Mix: The following grass mix shall be used in disturbed areas as directed.

Grass Mix #2

SPECIES	RATE OF APPLICATION (POUNDS PER ACRE PURE LIVE SEED)
P-27 Siberian wheatgrass	4
"Ephraim" Crested wheatgrass	5
"Sodar" Streambank wheatgrass	9
Total	18

Seed Mix Sources:

Approved dealers for the seed mixes are:

Granite Seeds (801) 768-4422
Grimm Growers (208) 785-0830

Wind River Seed (307) 568-3361
Maple Leaf (800) 287-3162.

Fertilizer: Fertilizer shall be 16-48-0 (NPK) ammonium or diammonium phosphate. Each component of the fertilizer may vary two percent.

Mulch: Mulch shall be processed grass straw.

EQUIPMENT:

Seedbed Preparation: Replace stockpiled material over disturbed areas to be used as a seedbed. Refer to Section 02000 - Earthwork. Use disks, harrows, roller harrow-packers (culti-packers), tooth type harrows, shovels, or other similar equipment as required to prepare the seedbed.

Seeding and Fertilizing: Use equipment such as drills with double disc and agitator, ground driller hand seeders, or culti-packers with seed boxes to apply seeding and fertilizer. Do not use dry broadcast seeders or hydroseeders.

PART 3--EXECUTION

Season of Work: Seeding shall be done between September 1 and December 15.

Seedbed Preparation: Topsoil and vegetation from clearing and grubbing shall be uniformly distributed over the trenches and other disturbed areas. Soil shall be tilled a minimum depth of 3 inches. The seedbed shall be firm below seeding depth and well pulverized and loose on top. It shall be free of clods and weeds. Seedbed preparation shall not be performed when soil conditions are not suitable for tilling; too dry, too wet, frozen, etc. Tillage shall produce cross-slope furrows on slopes.

On areas subject to severe erosion, the extent of seedbed preparation shall not exceed that which can be seeded in one day.

Fertilizing: Fertilizing shall closely follow seedbed preparation. Fertilizer shall not be mixed with seed. Fertilizer may be drilled or broadcast. Fertilizer shall be uniformly applied at a rate of 50 pounds per acre.

Seeding: Seeding shall closely follow fertilizing. If the seedbed has been disturbed, then Field Operations shall prepare the seedbed again. Seeds shall be thoroughly mixed prior to application. Seeds shall be uniformly applied at the previously specified rate. Seeds shall be buried 0.25 to 0.75 inches. Seeding shall not be performed when weather conditions are unfavorable: high wind, heavy rain, etc.

Drill seeding shall be performed in areas with slopes of 3:1 or flatter and where there is not excessive rock and gravel. Drilling shall maintain cross-slope furrows on slopes.

Mulching: Mulch shall be spread uniformly at a rate of 1 ton per acre. Mulch shall be anchored into the soil to a depth of at least 2 in., and with no more than one pass of the equipment. Mulching shall not be performed when wind interferes with mulch placement.

Protection: Traffic over seeded area shall be prohibited.

FIELD QUALITY CONTROL:

Surveillance will be performed by the Field Team Lead to verify compliance of the work to the drawings and specifications.

END OF SECTION 02486

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Technical Specification

PROJECT FILE NO. 020911

Waste Area Group 5 Remedial Design/Remedial Action–Phase 1

READY-MIXED CONCRETE GROUT

Prepared for:
U.S. Department of Energy
Idaho Operations Office
Idaho Falls, Idaho

INEEL
Idaho National Engineering and Environmental Laboratory
BECHTEL BWXT IDAHO, LLC

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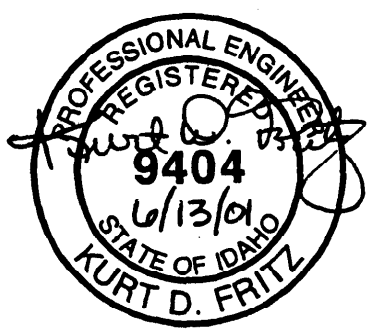
Waste Area Group 5 Remedial Design/Remedial Action-Phase 1

The following Section of this Specification was prepared under the direction of the Professional Engineer as indicated by the seal and signature provided on this page. The Professional Engineer is registered in the State of Idaho to practice Civil Engineering.



Division 3 -- CONCRETE

03310 -- Ready-Mixed Concrete Grout

SECTION 03310--READY-MIXED CONCRETE GROUT

PART 1--GENERAL

SUMMARY

Section Includes, but is not limited to:

Provide and place grout for pipe and tank encapsulation within disposal boxes.

Work Provided By Others: The Contractor shall supply labor and equipment to perform strength testing for each grout placement.

REFERENCES:

The following documents, including others referenced therein, form part of this Section to the extent designated herein.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301	Specifications for Structural Concrete
ACI 306.1	Standard Specification for Cold Weather Concreting

The following ASTM references may be used for testing of grout:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C31	Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C143	Slump of Hydraulic Cement Concrete
ASTM C150	Specification for Portland Cement
ASTM C172	Practice for Sampling Freshly Mixed Concrete
ASTM C494	Specification for Chemical Admixtures for Concrete
ASTM C618	Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
ASTM C939	Flow of Grout for Preplaced-Aggregate Concrete

The ASTM specifications for materials are not listed here but are listed in ACI 301.

DEFINITIONS:

General Definitions: Unless otherwise indicated in the Subcontract documents, definitions

shall be the same as those in ACI 301. Definitions with regard to cold weather shall be the same as those in ACI 306.1 except as modified herein.

SUBMITTALS:

Batch Tickets: One copy of each batch ticket shall be given to the Contractor's representative.

QUALITY CONTROL:

Comply with provisions of ASTM C94 unless otherwise specified herein.

DELIVERY, STORAGE AND HANDLING:

Comply with the requirements of ACI 301 for unless otherwise indicated.

See PRODUCTION OF GROUT for additional requirements.

SITE CONDITIONS:

All grout included in the work of this specification shall be delivered to the ARA area vicinity of the INEEL.

PART 2--PRODUCTS

MATERIALS:

Cement: Cement shall conform to ASTM C150, Type I-II. The cement shall contain no more than 0.60% by weight of alkalies calculated as ($Na_2O + 0.658K_2O$).

Aggregate: Fine aggregate shall conform to ASTM C33. No coarse aggregate shall be used in the grout supplied under this subcontract. Unless otherwise indicated, maximum aggregate size shall be 1/4 in.

Water: Mixing water for grout shall meet the requirements of ASTM C94.

Admixtures: Admixtures to be used in grout, when required or permitted, shall conform to the following appropriate specifications and shall be from the same manufacturer when multiple admixtures are used:

Mid-Range Water-Reducing Admixtures: ASTM C494. Master Builder's Polyheed 997.

High-Range Water Reducing Admixtures: ASTM C494. Master Builder's Rheobuild 1000.

Fly Ash: Fly Ash shall conform to ASTM C618, Class F, except that the loss on ignition (LOI) shall be less than 2%.

DESIGN MIXES (PROPORTIONING):

General: Grout for all parts of the work shall be of the specified quality and capable of being placed without excessive segregation.

Adjustment to grout mixes may be requested by the Subcontractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Revised mix designs shall be submitted and approved prior to use.

Slump and Flow Characteristics: Unless otherwise approved, the grout shall be proportioned and produced to be self-leveling and flowable around the pipe segments and dismantled tank after addition of water reducing admixtures. The slump for each grout batch shall be at least 11 inches.

Admixtures: Admixtures shall be subject to the following limitations or requirements.

Calcium chloride is not permitted.
All admixtures shall be used in accordance with the manufacturer's instructions.
Grout shall contain a high or mid-range water-reducer.

Strength: Provide a grout with a 28-day compressive strength, minimum, of 2,000 psi.

Proportions: Suggested grout proportions based on trial mixtures by the Contractor are as follows:

Material	Batch Weights, per cubic yard	
	Tank Grout	Box Grout
Water	433 lbs (52 gal)	800 lbs (96 gal)
Cement (type I/II)	320 lbs	680 lbs
Fly Ash	640 lbs	1600 lbs
Sand	2200 lbs	0 lbs
Gravel	0 lbs	0 lbs
Mid Range Water Reducer	up to 4 lbs	up to 2 lbs
High Range Water Reducer	up to 6 lbs	up to 4 lbs

Water and water reducers quantities may be adjusted to obtain desired slump and flow characteristics.

PRODUCTION OF GROUT:

General: Ready-mixed grout shall be batched, mixed and transported in accordance with ASTM C94, except as otherwise specified herein. Hand-mixed grout is prohibited.

Control of Admixtures: Comply with ACI 301 Section 4 unless noted otherwise. High-range water-reducers shall be added and mixed just prior to placement unless otherwise approved by the Contractor.

Control of Mixing Water: Comply with ACI 301 Section 4 unless noted otherwise.

Weather Conditions: Adjust grout delivery temperature for cold weather to comply with a minimum grout placement temperature of 50 degrees F.

SOURCE QUALITY CONTROL:

The Subcontractor shall provide the necessary testing and monitoring to qualify proposed mix proportion changes.

The Subcontractor shall notify the Contractor before batching grout. The Subcontractor shall provide the Contractor's representative all reasonable access for making checks of the production facilities and for securing samples.

PART 3—EXECUTION

GROUT PLACEMENT:

Metal Boxes Containing ARA-16 Piping: Supply grout as requested by the Contractor. Grout shall be pumped into the boxes as directed by the Contractor. Initial grouting has been performed to cover the bottom of each box with approximately 3 inches of grout. After the initial grout has sufficiently cured, the box shall then be loaded with pipe segments (by others) and then filled with the Box Grout. Vibrators shall be used to facilitate the grouting of each box. Grout shall be pumped into both ends of the boxes, as required, to completely surround the pipe segments on all sides.

Wooden or Metal Forms Containing ARA-16 Tank: Supply grout as requested by the Contractor. Grout shall be pumped into the tank as directed by the Contractor. Initial grouting shall consist of approximately 1/2 cubic yard of the Box Grout inside the formwork. After the initial grout has sufficiently cured, the tank shall then be filled with the Tank Grout. After the tank is filled, the exterior of the tank shall be grouted using the Tank Grout. Vibrators shall be used to facilitate the grouting of tank. The grout shall be pumped into the

formwork as required to completely surround the tank on all sides.

The Contractor's Representative may change the above as necessary to achieve the goal of grouting the tank with no obvious voids.

FIELD QUALITY CONTROL:

Subcontractor Supplied Tests: The Subcontractor or his agents shall provide the necessary testing and monitoring services to control and monitor the production, transportation and delivery temperature of the grout.

Sampling and testing for quality control during grout placement by the Subcontractor's representative shall include the following.

Sampling Fresh Grout: ASTM C172, except modified for slump, to comply with ASTM C94.

Slump: Monitor for self-leveling characteristics.

Grout Temperatures: Test for grout temperature prior to each grout placement.

Compressive Test Specimen: ASTM C31; at least 10 cylinders for subsequent Contractor compressive strength testing shall be made for each grout placement, unless otherwise directed. The cylinders shall be 3" x 6" plastic cylinder molds and shall comply with the requirements for testing per ASTM C39.

Contractor Testing:

Subsequent tests by the Contractor may include:

Compressive Strength Tests: ASTM C39.

Inspection or test results not conforming to the stated requirements shall be a basis for adjustment of the design mixes and additional tests.

Surveillance will be performed by the Contractor's representative to verify compliance of the work to the drawings and specifications.

END OF SECTION 03310